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Water for food production - Opportunities for sustainable land-water management using remote sensing

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Abstract:

Adaptation to global climate and environmental change in the context of the water-food nexus will require both understanding the nature of change of freshwater resources (e.g. where does precipitation fall, and how much there is?), and the engineering of regional strategies to manage water harvesting and water use (natural storage in aguifers and in the critical soil zone, and manmade alternatives including land-use/land-cover manipulation such as ramfed agriculture), leading to maximal resilience. In a world of increasing population, achieving and maintaining food security is a fundamental challenge for human development in the 21st century. Food security and sustainable agriculture go hand-in hand. The basis for sustainable agriculture is hydroecological resilience, which implies the Integrated Management of Land and Water Resources ("a land-use dTcision is a water"decision", Malm Falkenmark 2001). IMLWR requires systematic monitoring of the pathways by which joint space-time organization patterns of landform, precipitation, recharge (groundwater), distribution and storage (runoff) interact, and ultimately impact the so-called "green water" stocks critical for crop production (i.e. soil moisture in the unsaturated zone that is directly available to meet vegetation photo synthetic needs). IMLWR is ideally suited for a remote-sensing based monitoring and analysis framework. Here, an interpretive study is presented using a wide variety of remote sensing data (clouds, rainfall, and vegetation) from multiple satellite platfonns to assess the condition of freshwater stocks (rainfall) and hydroecological resilience in NW India, specifically the state of Punjab. Finally, the notion of hydrometeorological audit is proposed as a strategy for anticipating modes of failure in water resource systems, and to inform policy in the context of sustainable land-water management and food production.

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Resource Description

Communication: M

resource focus on research or methods on how to communicate or frame issues on climate change; surveys of attitudes, knowledge, beliefs about climate change

A focus of content

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Communication Audience: M

audience to whom the resource is directed

Policymaker

Exposure: M

weather or climate related pathway by which climate change affects health

Food/Water Security, Food/Water Security

Food/Water Security: Agricultural Productivity

Geographic Feature: M

resource focuses on specific type of geography

Mountain

Geographic Location: 🛚

resource focuses on specific location

Non-United States

Non-United States: Asia

Asian Region/Country: India

Health Impact: M

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

mitigation or adaptation strategy is a focus of resource

Adaptation

Resource Type: M

format or standard characteristic of resource

Research Article

Resilience: M

capacity of an individual, community, or institution to dynamically and effectively respond or adapt to shifting climate impact circumstances while continuing to function

A focus of content

Timescale: M

time period studied

Time Scale Unspecified

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Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system A focus of content